VOL. 29 NO. 4 JULY-AUGUST, 1951

THE EXPLOSIVES ENGINEER

REG. U.S. PAT. OFF.

Forerunner of Progress in Mining, Quarrying, Construction

FRANK A. MORGAN—*a biography* 100

FRANK A. MORGAN—*a portrait* 101

Editorial 102

B&O Railroad Builds a New Tunnel Near Clarksburg, West Virginia 103
By C. J. BURTON

Majestic Collieries Company 108
By JOHN W. LOUD, JR.

Hudson Coal Company's Birdseye Mine Awarded Sentinels of Safety Trophy 111

Quarry Superintendent Cooperates with School to Promote Safety Among Children 113
By PAT and GEORGE STURTEVANT

The Harlan County Dam in Nebraska 114
By W. T. LOGSDON

Sage Advice to Mine Foremen 118
By J. J. RUTLEDGE

Tales of a Gold Miner in Nicaragua (Part V) 120
By C. CARLETON SEMPLE

News Notes 125

Views and opinions expressed by the authors of articles in this publication are their own, and they do not necessarily represent those of the publisher.

A double-track tunnel, 3,300 ft. long, 31 ft. wide, and 28 ft. high, lined with steel and concrete, is being driven under a West Virginia hill 2 miles east of Clarksburg, for use by the Baltimore and Ohio Railroad on its main line to St. Louis. It will replace an existing single-track tunnel that was completed and put into service by the B&O in 1855.

The construction of the new tunnel is proceeding through shale and a 9-ft.-thick seam of Pittsburgh coal. The coal bed had been mined previously by the room-and-pillar system, and some difficulty is experienced in controlling the roof and floor of the seam.

A description of the activities on the project is presented in an article on page 103, by C. J. Burton.

••

In an area comprising 10,000 acres of land near Cedar, West Virginia, that includes seven workable seams of coal, most of the mining activities of Majestic Collieries Company are carried on in the Warfield seam. The average height of the coal is 66 in., including 8 in. of bone near the top. For the most part, the seam involves hilly conditions, with average roof conditions.

John W. Loud, Jr., summarizes the company's operating procedures in the article beginning on page 108.

••

Every year, a quarry superintendent in California conducts teen-age students of a nearby school on a tour of the quarry property. During the visits he explains the work in progress, with special emphasis on the safe handling and use of explosives. A brief account of this unusual custom, by Pat and George Sturtevant, may be found on page 113.

••

The Harlan County Dam, 2 miles long, with a 1,350-ft. spillway in the center, is in the course of construction on the Republican River, 9 miles east of Alma, Nebraska, by a group of seven nationally prominent firms, under contract with the U. S. Army Corps of Engineers. The reservoir that will result from the huge structure will provide 500,000 acre-feet of space for the storage of water during high-river stages.

The article beginning on page 114, by W. T. Logsdon, reviews the work being done.

••

Officials of The Hudson Coal Company were hosts at a dinner-ceremony in Scranton, Pennsylvania, July 14, 1951, to honor the men of their Birdseye mine for having won the Sentinels of Safety Trophy in the National Safety Competition of 1950, in the anthracite group. A report on the happenings at the affair will be found on page 111.

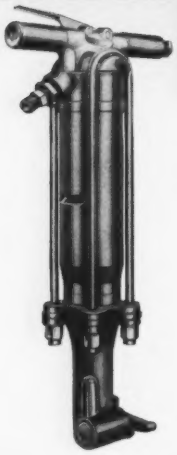
EDITORIAL STAFF: JOSEPH I. HORTY, *Managing Editor;* ELIZABETH M. JOYCE, *Assistant Editor;* GERTRUDE A. DONNELLY, *Assistant Editor;* EDWARD L. GRANT, *Art Editor;* FRANK J. CANOVA, *Production Manager;* CHARLES E. RABENOLD, *Advertising Manager,* THEODORE MARVIN, *Director;* MONTGOMERY R. BUDD, *Associate Director.*

SUBSCRIPTION RATES: *United States and Canada*—One Year, $1.50; Single Copies, $.30. *Limited Subscriptions Only to Other Countries*—One Year, $2.50; Single Copies, $.50.

THE EXPLOSIVES ENGINEER, 913 DELAWARE TRUST BUILDING, WILMINGTON, DELAWARE. PRINTED IN UNITED STATES OF AMERICA.
COPYRIGHT 1951. PUBLISHED BY HERCULES POWDER COMPANY.

CCA

K ... is for the Knockout power in JOY PAVING BREAKERS

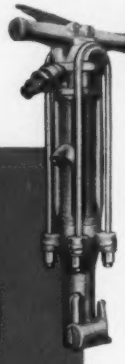


K-89 ... New Super heavyweight

There's real knockout power in this 90 lb. super breaker. The K-89 is designed to speed up demolition of those extra tough-and-heavy reinforced concrete sections, etc. Like all Joy SILVER STREAK Paving Breakers, the K-89 is cadmium-plated inside and out, which prevents rusting, eliminates scoring and aids lubrication.

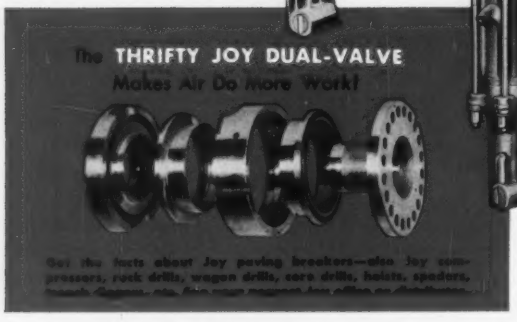
K-81 ... heavyweight

Handles tough demolition jobs economically and efficiently—breaks more concrete because it strikes more and heavier blows, and because it's easier to hold. Outstanding features of the K-81 include the exclusive Joy "Dual Valve," flat-sided cylinder for easy holding against operator's leg, replaceable chuck bushings, "U" type side rods and rugged cam-type retainer.



K-61 ... medium weight

Specially suited for thin-section concrete and other light demolition jobs—hard-hitting and easy-handling like the K-81, but lighter in weight. Many of the parts, such as the chuck housing, chuck bushing and throttle, will fit both the K-61 and K-81—a considerable saving in repair parts stock.



Get the facts about Joy paving breakers—also Joy compressors, rock drills, wagon drills, core drills, hoists, spaders,

K-31 ... lightweight

Only 30 lbs.—a powerful, easy-handling little breaker that's ideal for light demolition and all work where the operator must support the entire weight of the tool, or where footing is not solid, as on scaffolds.

Write for Bulletins, or

Consult a Joy Engineer

100 YEARS OF ENGINEERING LEADERSHIP W&O C 3517

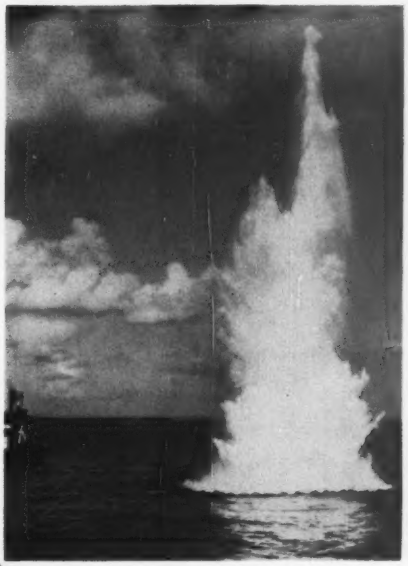
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Special Explosives for Geophysical Exploration

For seismic exploration on land or under water, Hercules has developed a full series of special explosives to give accurate recordings under the varying conditions encountered by field crews. These explosives are quickly available throughout the oil-producing areas. Write for name of nearest distributor.



VIBROGELS®
. . . these special gelatins are designed to give accurate records and uniform results under severe conditions.

GELAMITE® S
. . . economically replaces "Vibrogels" for some seismic work.

SPIRALOK®
. . . time-saving rigid cartridge assembly.

VIBROCAPS®
. . . no-lag seismic detonators.

TITAN® CAPS 10V and 20V
. . . for use where extra-strong detonators are needed.

HERCULES POWDER COMPANY
INCORPORATED
990 King Street, Wilmington, Delaware

X051-1

Frank A. Morgan

PRESIDENT, AMERICAN ASSOCIATION
OF PETROLEUM GEOLOGISTS
VICE PRESIDENT AND MANAGER OF EXPLORATION
RICHFIELD OIL CORPORATION

A Biography

A KEEN ZEST for tackling difficult technological problems and the ability to solve them have been the principal factors contributing to the successful career of Frank A. Morgan, vice president and manager of exploration, Richfield Oil Corporation. His recent election to the presidency of the American Association of Petroleum Geologists, comprising a world-wide membership exceeding 8,000, recognizes his outstanding abilities as a top-flight scientist and business administrator.

Frank, as he is known to his friends, was born January 14, 1898, in the Mother Lode mining region of California at Sonora, Tuolumne County, the son of Frank A. and Ora (Moss) Morgan. His grandparents had followed the gold rush from England and settled in Columbia, California, in 1851. His father was born in Columbia; his mother came to California from Tennessee as a young girl.

After completing the grade-school and high-school courses in Sonora, Frank attended the University of California at Berkeley, majoring in geology. He was graduated in 1920.

For nine years following his graduation from the University, Frank was in business for himself as a consulting geologist and valuation engineer. In 1928, he was prominently identified with the discovery of the Elwood oil field in Santa Barbara County, by the Rio Grande Oil Company. In 1929, he went to work for Rio Grande as vice president and chief geologist. He continued in that capacity until 1937, when Rio Grande participated in the reorganization of the old Richfield Oil Company. Frank was active in handling many of the details involved in the creation of the new company, now known as Richfield Oil Corporation. Soon after its formation, he was elected vice president and manager of exploration of the corporation.

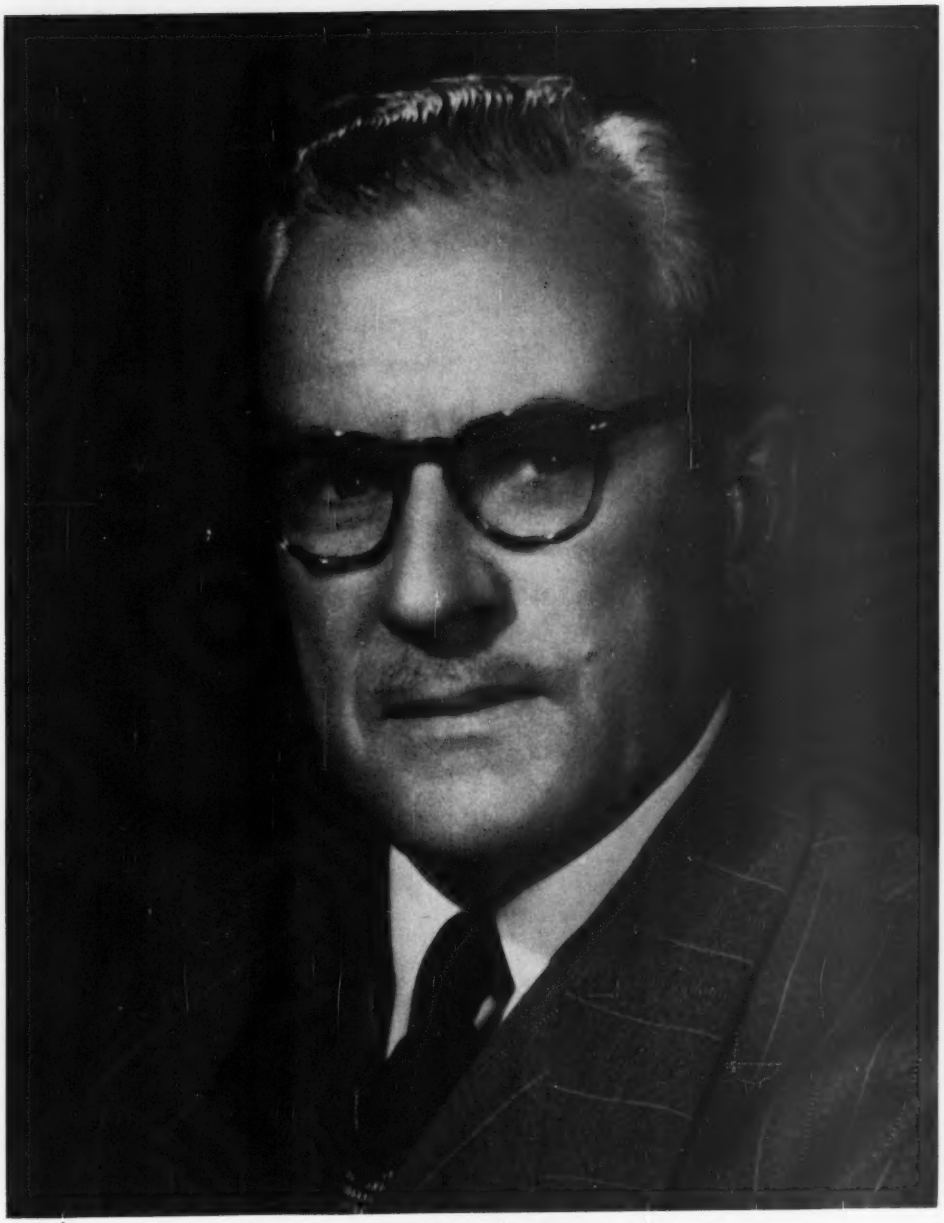
Upon assuming the responsibilities of this job, Frank found himself with an organization that had no geologists, no undrilled lands, no immediate new oil prospects, and a rapidly declining production. Since that time, under his direction, Richfield's Exploration Department has been built into a compact, highly competitive unit. Production properties have grown rapidly through discoveries and advantageous lease acquisitions. During this period of development and expansion, three major discoveries stand out where the company controlled all or substantially all of the lands: North Coles Levee in 1938; Cuyama Valley's Russell Ranch field in 1948; and South Cuyama in 1949. These discoveries were largely responsible for Richfield's rise from the bottom of the list in 1937 to second position in California's current petroleum production. During this time Richfield's underground reserves have been increased from less than 50 million barrels in 1937 to an estimated 450 million barrels in 1951.

Frank Morgan, the boss of the discovery department (and other related things) for Richfield Oil Corporation, modestly states that his Elwood oil-field discovery in 1928 might have been a one-man job, like the work of the country doctor, but now he is just part of the team and it is hard to tell who is doing the most work because of the dust.

Frank holds memberships in the Petroleum Club of Los Angeles, the California Club of Los Angeles, Pi Kappa Alpha fraternity, and the Masons. He is an active vestryman of All Saints Episcopal Church in Beverly Hills and, incidently, sings in the choir.

Frank A. Morgan married Helen Starke on March 28, 1921, in Berkeley, California. They have three children: Frank A., Jr., a consulting geologist, Casper, Wyoming; Russell M., a student at Stanford University; and Helen Ann Morgan. The family home is at 1228 North Wetherly Drive, in Los Angeles.

With the 1952 meeting of the A.A.P.G. scheduled for Los Angeles next March, geologists, geophysicists, paleontologists, and mineralogists will have an unusual opportunity to meet this gracious and talented family, who will be proud hosts to their geological friends from all over the world.



FRANK A. MORGAN

Editorial

Help Protect Children From Blasting Cap Accidents

There is no letup in the campaign by the Institute of Makers of Explosives, an association of explosives manufacturers, to eliminate accidents to children from playing with blasting caps. Through the years, it has rallied the support of many agencies and societies of the country in an effort to stop these needless mishaps. In the campaign this year the Institute enlisted the help of superintendents of city, town, and county high schools, junior high school principals, county agents, national associations of chiefs of police and sheriffs, newspapers, radio stations, magazines, trade journals, and various child welfare organizations. The Boy Scouts of America, through each of its 550 district councils in the United States, has again renewed its efforts to carry warnings to the boys and girls of the nation.

The Institute's program was begun in 1927, a year in which about 280 youngsters were injured from playing with blasting caps. In 1929, the production of industrial explosives increased, and the number of blasting cap accidents to children increased. For many years the pattern was the same—as more explosives for industry were produced, more children were injured. When production declined, the number of accidents dropped.

I'M A BLASTING CAP!
I'M AN INCH OR TWO LONG
LOOK LIKE A CARTRIDGE
SOMETIMES I'M IN A DIFFERENT SHAPE-
-BUT I'M USED TO SET OFF BIG EXPLOSIONS
BELIEVE ME PARD-
I'M VERY DANGEROUS
SO IF YOU FIND ME LYING AROUND-
WHATEVER YOU DO-
DON'T PICK ME UP!
REPORT ME TO A GROWN-UP AT ONCE AND PREVENT AN ACCIDENT!

Because of an increase in safety consciousness on the part of users of industrial explosives, aided by the tireless efforts of the Institute, this pattern has been changed. During 1950, when the production of explosives was very high, the number of children injured from blasting caps was reduced to 66.

The increased activity in mines and quarries, and on highway and building construction in every section of the country at this time, multiplies the possibilities of blasting caps getting into the hands of young boys and girls. Newspaper reports of children exploding blasting caps "for the fun of it" are alarming. Some more ambitious juvenile finders of caps use them to make bombs which, when detonated, startle the neighborhood.

Stop Dangerous Pranks

The recent action of a school safety supervisor in an eastern city, with the cooperation of the Institute of Makers of Explosives, affords an excellent example of how to stop such dangerous pranks. The morning following an explosion of one such bomb on the grounds of a deserted school property, the safety supervisor got busy. In a few hours, posters, leaflets, and similar material were distributed to all of the schools in the city, warning the children of the dangers of playing with blasting caps. A print of the all-color, 16-mm., 15-minute sound moving picture "Blasting Cap" was obtained from the Institute and shown to teenagers. Display boards of dummy blasting caps were posted in conspicuous places to further explain to the students the danger of the blasting caps in youthful hands. The local newspapers and radio stations publicized the program. The reaction was practically immediate and blasting caps stopped being a substitute for normal outdoor activities.

Look on page 113 of this issue for an unusual example of how the danger of playing or tinkering with blasting caps is impressed upon the memories of young students.

Start a Local Program

If the children of your community are exposed to the possibility of contact with stolen or misplaced blasting caps, you can help to initiate a similar program. You can insist that local agencies make periodic investigations to insure that users of explosives keep blasting caps under lock and key. You can get the cooperation of city, town, and school officials, newspapers, radio stations, the police, firemen, Boy Scouts, and the Institute of Makers of Explosives. Prints of the sound movie, "Blasting Cap," are available at the Institute's office, 343 Lexington Avenue, New York 16, New York.

B & O Railroad Builds a New TUNNEL

Near Clarksburg, West Virginia

Modern double-track tunnel will provide for the unrestricted movement of the largest railroad rolling stock now in use

C. J. BURTON*

THE Baltimore and Ohio Railroad's Tunnel No. 1, two miles east of Clarksburg, West Virginia, on the Third Division (now the Monongah Division) of the road's main line to St. Louis, was completed and put into service in 1855. Very little is known today as to the methods used or the construction details involved in driving this tunnel that pierces the ridge dividing the waters of Simpson Creek and West Fork River.

Tunnel No. 1 is a single-track job 2,700 ft. long, 18 ft. high above the top of the rails, 14 ft. wide, and lined with cut stone masonry and brick. There were approximately 30,000 cu. yds. of excavation in the bore and about 28,000 cu. yds. in the approaches. The Pittsburgh seam of coal was encountered. No mining had been done, and the presence of the coal seam at the tunnel location was a fortunate circumstance in carrying on the details of advancing the bore.

The old tunnel was adequate for the rolling stock and the volume of freight tonnage offered 97 years ago, and for many years thereafter. With the great increase in the size of engines and cars in recent years, plus the added freight tonnage moved, the need to eliminate the clearance restrictions of Tunnel No. 1 became urgent and plans for a new double-track tunnel were developed.

*Clarksburg, West Virginia.

A contract for the excavation of the approaches to the new tunnel was awarded in May, 1950, to Keeley Construction Company, Clarksburg, West Virginia. The following month, a contract was awarded to Bates & Rogers Construction Corporation, Chicago, Illinois, for the construction of a new tunnel which will permit the unrestricted movement of the largest railroad rolling stock now in use.

The length of the new tunnel is to be approximately 3,300 ft., the width at spring line 31 ft., and the height above the rails 28 ft. Excavation for the tunnel is estimated at 135,000 cu. yds. The bore will be lined with steel and concrete.

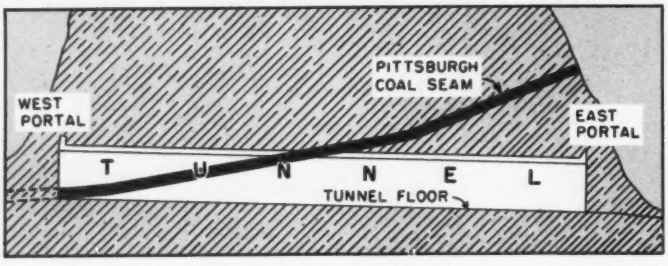
East End of Tunnel

The east end of the new tunnel is located 450 ft. south of the old tunnel. It penetrates shale, varying from medium-hard to soft, and through a 9-ft.-thick seam of Pittsburgh coal. On the east end, the coal deposit is about 50 ft. above the top of the tunnel; on the west end, the floor of the coal seam is also the floor of the tunnel. The grade of the tunnel rises .3 per cent from east to west, and the coal dips from east to west at 2.4 per cent. These elevations brought into contact

STEEL SUPPORTS: A close-up of some of the steel lining in place. To complete the project, 7½ million pounds of shaped steel ribs and watershed lagging will be required.

NEW TUNNEL LOCATION: An overall view of the new and old B&O railroad tunnel locations, two miles east of Clarksburg, West Virginia, is shown in the picture above. A portal of the new tunnel can be seen under the hill, left of center. Old tunnel portal is visible at right of center.

EAST PORTAL: The east end of the new tunnel is 450 ft. south of the old tunnel. It was driven through a variable shale formation and a 9-ft. seam of Pittsburgh coal.



TUNNELING THROUGH COAL: The vein tunnel is being driven through a variable shale formation and a 9-ft.-thick seam of Pittsburgh coal. Some difficulty is experienced in controlling the floor and roof of the coal seam.

the top of the tunnel bore and the bottom of the coal seam at about 1,220 ft. from the east end. From that point, the coal seam will be present to the west end of the tunnel.

The coal bed encountered at the new tunnel location had been mined by the room-and-pillar system, and some difficulty is experienced in controlling the floor and roof of the coal seam. Most of the old mine workings are completely gobbed with unstable material which has to be removed. Sawed wood cribbing is installed for the protection of workmen and equipment at the tunnel working faces, and to brace and support loose sides and the top of the tunnel.

No mine gas has been found. The tunnel drains to the east and the mine to the west. Water from the mine has created considerable difficulty and necessitated additional expense in maintaining a passable haulage road in the tunnel. The water is high in acid content and is very active on the steel pans.

Ventilation at the east end of the tunnel is provided by an Ingersoll-Rand electrically driven fan, producing 2,200 cu. ft. of air a minute and delivering it to the face through metal Naylor pipe supported on ribbing inside the tunnel.

Drilling is done from a four-deck jumbo built of steel H beams and wood floors, on which 11 drills are installed. On the decks of the jumbo,

seven of the drills are mounted on Ingersoll-Rand booms and, at the bottom, four are mounted on columns and arms. The jumbo is moved to and from the face on steel rails by a tractor.

Compressed air for the drills is supplied by six electrically driven compressors operating in series and delivering air at 100 lbs. a square inch to a storage tank, and from the tank through a 6-in. pipe line to the tunnel working face.

Drilling and Blasting

Holes for blasting are drilled 8 ft. deep, spaced as shown on the accompanying drill data chart. Water for the drills is obtained from a nearby spring located well above the top of the tunnel level. It is conveyed to a storage tank through a 2-in. pipe line and from the tank to the tunnel working face at a pressure of 40 lbs. a square inch. This is stepped up to 75 lbs. a square inch by the employment of a reciprocating pump and a regulator in the air line.

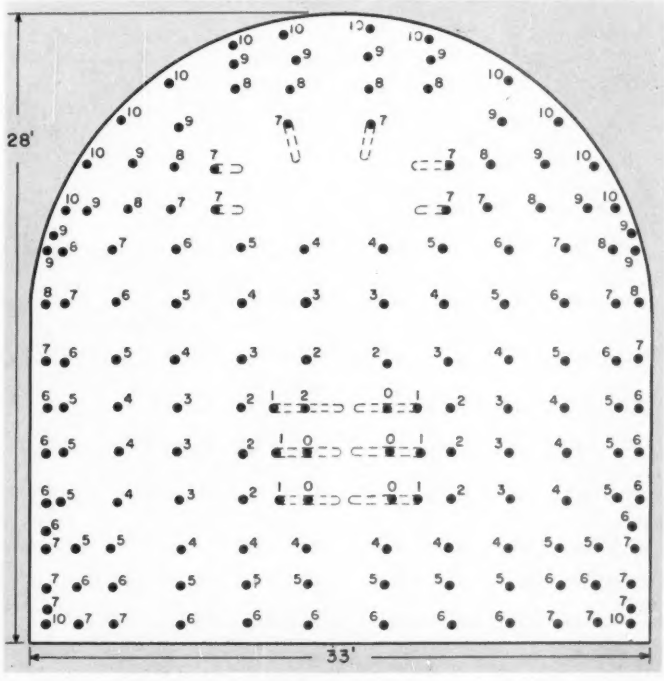
The drill holes are loaded with 1½ by 8-in. cartridges of Gelamite* 2. The amount of dynamite loaded per round varies to conform with the conditions encountered in drilling a round. The explosives charges are primed with No. 6 Electric Blasting Caps and Delay Electric Blasting Caps from 1 to 10 inclusive. The location of the drill holes and the order of firing a typical round in the tunnel are indicated in the drill data chart shown at the right.

Blasts are fired by 440-volt alternating current conducted to the face by No. 8 rubber-covered copper wire and connected to open end bus bars. The leg wires of the Electric Blasting Caps and Delay Electric Blasting Caps are connected in parallel to the bus bars.

A firing switch is located 1,000 ft. inside the tunnel. It is kept locked in open position until a blast is to be fired. A safety switch is installed between the firing switch and the tunnel face. It, also, is locked in open position until time to fire a blast. After the men and equipment have been moved to safety zones, the shot-firer closes the safety switch and unlocks the firing switch box. The blast is

*Reg. U. S. Pat. Off.

WEST PORTAL: Operations at the west end of the tunnel called for getting the bore started under the hill, erecting steel supports, and concreting the entrance.



TYPICAL TUNNEL ROUND: The small, black circles in the above chart represent the location of drill holes in a round in the tunnel heading and the figures beside the circles indicate the order of firing a blast.

WOOD CRIBBING: In the mined-out section of the coal seam, the contractor installed sawed wood cribbing to support the top and loose sides of the new tunnel.

fired, after which the firing switch is again locked in open position to await the next blast.

The drill holes in an average blast are loaded with 600 to 700 lbs. of Gelamite 2, on a loading ratio of approximately 2 lbs. of dynamite per 1 cu. yd. of rock in the solid. Breakage per round yields from 300 to 350 cu. yds. of muck, representing about 41 cu. yds. for each 1 ft. of tunnel advance.

The fragmentation from blasts is excellent and the new face, sides, and corners of the tunnel are cut clean. The broken material is piled about 20 ft. high against the face with very little of it thrown back on the tunnel floor. The muck is loaded to the hauling equipment by a 2-cu. yd. power shovel, which moves through the jumbo to the muck pile. The hauling equipment also passes forward and backward through the jumbo. All of the excavated material from the east end of the tunnel is waste.

Lining for the Tunnel

To support the roof and sides of the tunnel, 7½ million pounds of shaped steel ribs and watershed lagging will be required. The ribs are placed on 2-ft. centers. Each set is made of four parts, two straight sections reaching from the base to the spring line, and two curved sections forming the arch at the top. The two lower sections of each set are placed in front of and on either side of the jumbo, and the two top sections are placed from the top of the jumbo. Each rib is bolted to the next one at several points, assuring proper alignment. The watershed lagging is placed from the top of the jumbo after each set of steel is in place. This lagging consists of shaped flat metal plates bolted to the ribs from the center of the top each way down to the spring line. It is one of the later improvements in tunnel construction material. These supporting units are being supplied by Commercial Shearing and Stamping Company, Youngstown.

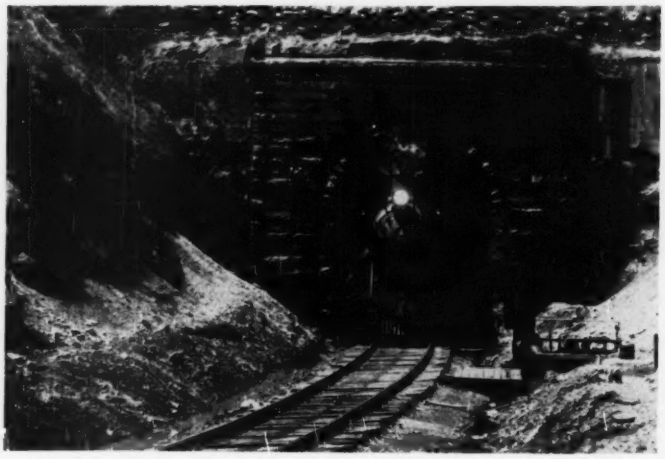
The space between the steel lining and the excavation break line in the tunnel is packed with crushed limestone. To hold the crushed stone in place along the side walls to the spring line, 1-in. board lagging is used behind the posts. Where the coal seam is encountered, some wood cribbing is in use over the arch.

A lining of concrete 22 in. thick will be placed inside the steel ribbing. This item will require an estimated 23,000 cu. yds. The concrete will be mixed at a plant a short distance from the east end of the tunnel and will be moved into the tunnel by trucks.

Coated metal drain pipes, 6 in. in diameter, are placed in the side walls of the tunnel to discharge water and seepage from the old coal mine workings into an 18-in. half-round vitrified tile drain carried in a concrete gutter at subgrade level.

Alternating current of 440 volts, supplied by Monongahela Power Company, is used, except for lighting. For the latter purpose, 220-volt alternating current is employed. For general purposes, 100-watt light bulbs are utilized. Larger bulbs are installed in flood lights about the tunnel face and at other locations where necessary.

The equipment in use at the east end of the tunnel includes one Lima D 2-cu. yd. shovel; three Euclid 10-cu. yd. trucks; two Tournarockers, 9 cu. yds.; one Ingersoll-Rand 22,000-c.f.m.



THE OLD TUNNEL: One of the railroad company's smaller engines emerging from the east portal of B&O's old, single-track tunnel 18 ft. high and 14 ft. wide.

fan; eleven Ingersoll-Rand DA 35 drifter drills; six Gardner-Denver WB stationary compressors; one drill bit regrinder; one Smith 2-cu. yd. concrete mixer; 1¼-in. round crucible drill steel; and Ingersoll-Rand 2-in. and 2½-in. detachable drill bits. A well-equipped shop is maintained, and all repair work except major items can be attended to on the job.

West End of Tunnel

At the west end of the tunnel, the work involves getting the bore started under the hill, erecting some steel in place, and concreting the entrance. Because of the irregularity of the ground, no regular drilling pattern has been established. The same grades and types of explosives and detonators are employed as are used on the east end. Only a few drill holes are loaded and fired at a time. The blasts are fired by a Hercules 50-cap blasting machine. Steel for lining the tunnel is handled in the same way as on the east end.

The equipment at this location includes one Bay City 1¼-cu. yd. shovel; one P and H truck crane; one Euclid 10-cu. yd. truck; one Hough 1½-cu. yd. Payloader; two Ingersoll-Rand 2-in. water pumps; two Chicago Pneumatic 315-c.f.m. compressors; and one 1,000-cu. ft. air storage tank.

The construction of the new tunnel is under the direction of Baltimore and Ohio Railroad's A. C. Clarke, chief engineer, with general supervision by W. W. Gwathmey, Jr., engineer of construction. J. W. Jones is regional engineer, and the design of the project is by C. E. Sloan, engineer of bridges. G. E. Norris, resident engineer, and C. M. Carnahan, project engineer, are in charge in the field. For Bates & Rogers Construction Corporation, John W. Rogers, vice president and treasurer of the corporation, is in charge of construction details with M. C. Warmbier as superintendent. Carter Fore is the walker on the east end, and John Gullans is the walker on the west end.

Approaches to the Tunnel

The movement of excavated material in the tunnel approach for the east portal was started by Keeley Construction Company on May 8, 1950. It was completed by the contractor on July 4, 1950, after 200,000 cu. yds. had been moved. All of the excavated material was waste. After work on the east end was well under way, the Keeley Company moved part of its equipment to the west end and work began there on June 1, 1950. Approximately 250,000 cu. yds. of material were moved and the job was completed in good time.

Most of the excavated material at both ends of the tunnel approaches was shale, with some blocky sandstone. At the west portal approach, the blasted rock was utilized in constructing a roadbed for the improvement of the alignment of the main line tracks, and for relocating a State secondary roadway that crossed the railroad tracks at grade in the town of Despard.

The Keeley Company used wagon drills and vertical and horizontal auger drills to spot holes 12 ft. deep on 6-ft. centers for blasting the rock formations on the projects. The drill holes were loaded with a 40% ammonia-type dynamite, in 1¼ by 8-in. cartridges, primed with No. 6 Electric Blasting Caps. The cap leg wires, 18 ft. long, were connected in series and blasts were fired with a conventional blasting machine. Several occupied dwellings were close to some of the blast areas and extreme care was exercised in loading and firing the blasts.

Two power shovels, a 2½-cu. yd. Northwest and a 2-cu. yd. Lorain, were employed to load blasted shale into 8-cu. yd. Euclids for delivery to the railroad roadbed and the roadway relocation. These units were supplemented with a variety of equipment—bulldozers, carryalls, scrapers, and graders.

The Keeley contract required the employment of 60 men. All operations were under the direction of H. G. Schimmel, general superintendent, and Porter Maxwell, project superintendent.

CONCRETE MIXING PLANT: A lining of concrete 22 in. thick will be placed inside the steel ribbing in the tunnel. The job requirements of 23,000 cu. yds. will be mixed in this plant.

READY FOR SHIPMENT: The prepared coal is loaded at the plant into railroad cars for shipment to the market. Present plant capacity is approximately 3,500 tons a day.

MAJESTIC COLLIERIES COMPANY

A brief summary of coal-mining operations in the Warfield seam at Cedar, West Virginia

JOHN W. LOUD, JR.*

MAJESTIC COLLIERIES COMPANY began coal-mining operations on a modest scale in 1906, on leased property of small acreage at Cedar, West Virginia. The coal was recovered in what was referred to as the Cedar seam, and shipments were made over the Norfolk and Western Railway. Two years later, a railroad crossing was built across the Tug River, up Poplar Creek, and the company opened another mine in the Warfield seam.

Subsequently, the leased property was purchased by the company and additional land was acquired. At present, Majestic owns approximately 6,000 acres of mineral and surface properties, plus 4,000 acres under lease from Kentland Coal & Coke Company and Hurricane Mineral Corporation.

Seven workable seams are located in the 10,000-acre area. All of the coal is classified as a high-quality, high-fusion, medium-volatile product, with low ash and low sulphur content. The seams have the same general characteristics and blend into a product that is excellent for steam, domestic, or by-product purposes.

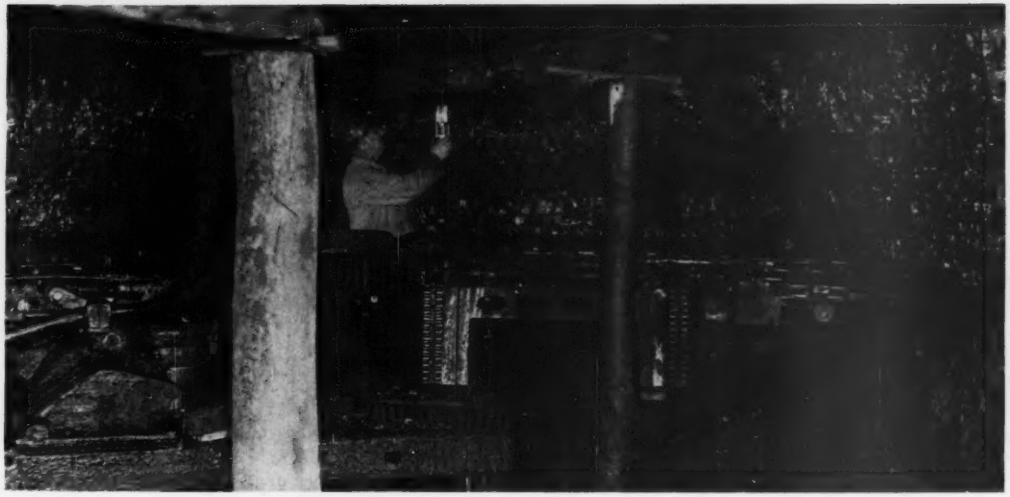
Most of the mining is carried on in the Warfield seam, with an average height of 66 in. including about 8 in. of bone near the top. The coal is covered by overburden ranging from 200 to 600 ft. thick, with a fairly soft bottom. For the most part, the seam involves hilly conditions, with average roof conditions. In general, the permanent roof is sandstone. In several places, draw slate and shale, from 10 to 30 in. thick, are encountered. This makes necessary careful cross-collaring, or bolting, the roof. The underlying seams are low, from 38 to 52 in., with good roof conditions.

The crew at a working face comprises 14 men and a foreman. The usual cycle of work starts with a two-man crew at a 20-ft. face pinning the roof with 1 by 42-in. wedge-type bolts, using a Cleveland stoper drill. The roof contains about 24 in. of draw slate, and roof bolting is the first order of business so that the working place is made safe for the Goodman Gobber operator to cut and prepare the area for the loading machine crew. This Goodman machine with a double bar will cut and load approximately 25 tons of material, making a 12-in. kerf, and provides ample space for drilling and blasting the coal.

Ordinarily, five holes are drilled into the coal seam by a two-man crew, the number of holes being dependent upon the location of the kerf. The holes, 7½ to 8 ft. deep, are drilled with a Chicago Pneumatic 472 unit. They are loaded with 1½ by 8-in. cartridges of Permissible explosives and primed with Hercules† Electric Blasting Caps. The charges are stemmed to the collar with dummy bags of rock dust. Blasts are fired with a Permissible blasting machine.

After a blast has been fired, a type 460 track-mounted Goodman loading machine, with a tramming speed of 4 miles an hour, is moved in to recover

*Hercules Powder Company, Bluefield, West Virginia.
†Reg. U. S. Pat. Off.



AT A WORKING FACE: Undercutting the coal at a working face with a Goodman Gobber is temporarily interrupted while the foreman tests the area for gas.

the coal and load it into 6-ton steel mine cars. This Goodman machine is equipped with a loading head 8 ft. long, and has a turning radius of 55 degrees. This affords protection for the operator at all times: he is stationed at least 14 ft. back from the working face, is away from smoke following a blast, and operates under a roof reinforced by cross bars and bolts. In one section, a 7 BU Joy machine is used to load out the coal after a blast.

The principal equipment used in the mine includes sixteen Westinghouse locomotives—six 902's, nine 904's, and one 907; four Jeffrey 110 trip motors; nine 12AA Goodman Shortwall and three 35BB Jeffrey Shortwall cutting machines; and one 724CT Goodman Gobber double bar longwall loading machine equipped with a conveyor for loading coal into mine cars.

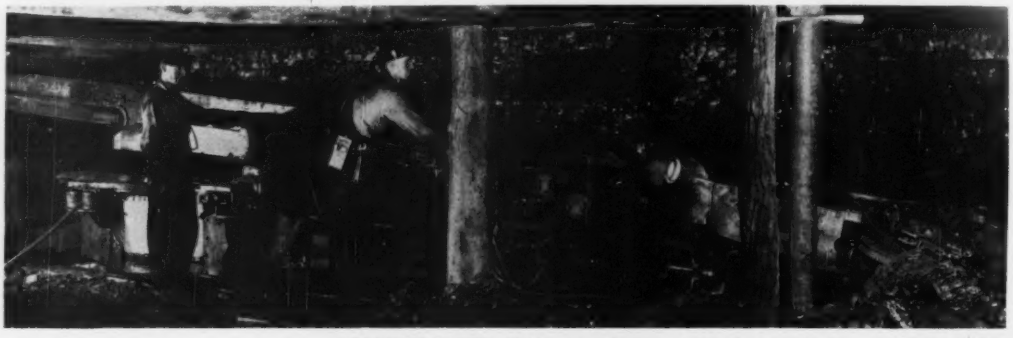
The coal is prepared for marketing through a modern preparation plant designed and erected by Roberts & Schaefer Company. At present, the daily capacity is 3,500 tons, ranging in size from slack to 5 in., and lump.

The sales agent for the company is Sovereign Pocahontas Company, with offices and representatives in the principal market areas east of the Mississippi River.

DRILLING IN THE COAL: A two-man crew, using a 472 Chicago Pneumatic unit, drills holes 8 ft. deep for blasting in the coal seam.

TAMPING EXPLOSIVES: After a hole is loaded with Permissible powder, the shot fireman stems it to the collar with dummy bags of rock dust.

AFTER A BLAST: The superintendent makes tests of the roof and gas conditions after a blast in the coal at a working face in the mine.



RECOVERING THE COAL: A track-mounted 460 Goodman loading machine is used to recover the blasted coal and load it into 6-ton mine cars.

Majestic Collieries Company was organized in 1906, with P. P. Flanagan, a prominent coal operator, as president. Shortly after, individuals associated with Ashland Coal and Coke Company and other mining companies in the Pocahontas field made substantial purchases of stock in the new company. W. A. Philips became Majestic's president, with S. W. Patterson, vice president. They remained in office until their deaths in 1924 and 1932, respectively.

In 1925, W. A. Richards was elected to the presidency. After the death of Mr. Richards in 1940, Wade W. Walker became president of the company. He has continued in that capacity ever since. Other officials include W. Clinton McSherry, vice president; Con R. Graeber, treasurer; and Joseph E. Ludes, secretary. The supervision of operating details at the mine and plant are delegated to E. C. Lewis, superintendent; J. W. Reese, chief engineer; M. V. Bailey, general mine foreman; Joseph McClellan, mine foreman; J. D. Price, chief electrician; and J. W. Vaughn, cashier.

OPERATING SUPERVISORS: Activities underground are under the direction of Superintendent E. C. Lewis, at right, and M. V. Bailey, general mine foreman.

The author is grateful for the cooperation of Mr. Walker, Mr. Lewis, and Mr. Bailey of Majestic Collieries in the preparation of this article.

THE BIRDSEYE MINERS: Officials of The Hudson Coal Company paid tribute to the Birdseye miners at a dinner-ceremony in the Scranton Club, for having won first place in the National Safety Competition.

Hudson Coal Company's Birdseye Mine Awarded Sentinels of Safety Trophy

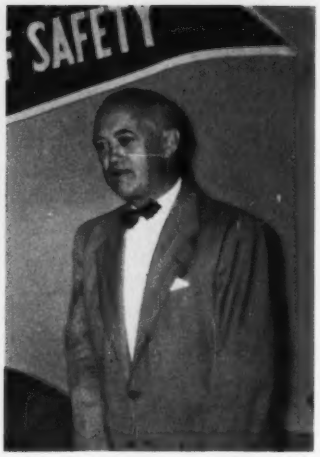
The winners in the anthracite group in the National Safety Competition are honored at a dinner-ceremony in the Scranton Club

OFFICIALS of The Hudson Coal Company were hosts at a dinner-ceremony in the Scranton Club, Scranton, Pennsylvania, July 14, 1951, to honor the employes of their Birdseye mine for having won first place in the National Safety Competition of 1950, in the anthracite underground mines group. The winning record of the Birdseye miners—113,738 man-hours of work with only 4 disabling injuries that caused a total time loss of 19 days—was the best among the 52 mines enrolled in the group.

Following dinner, which was interspersed with music, John M. Reid, general manager of the Hudson Company, extended congratulations to the Birdseye employes from everyone in the company. "You men didn't make the best safety record in your group last year because of luck," he said. "Our records show that through the years Birdseye mine has been awarded 11 company safety flags and has won

EDGAR C. WEICHEL: After congratulating the winners on their splendid record in 1950, Vice President Edgar C. Weichel commented that "good safety records are impossible without the intelligent cooperation of good men."

PRESENTING THE TROPHY: In reviewing the conspicuous improvement in the Birdseye safety records since 1947, Joseph I. Horty, managing editor of The Explosives Engineer, said that it was due primarily to the good judgment and common sense of each man working in the mine.



WESLEY I. STONEBRAKER: In his remarks, the superintendent of Olyphant-Eddy Creek colliery said, "Birdseye's winning safety record last year is especially praiseworthy because it was made despite adverse physical conditions in the mine."

3 honorable mentions in the National Safety Competitions. We knew it was only a question of time before you came up with the highest award of all, the Sentinels of Safety trophy. All of us in The Hudson Coal Company organization are mighty proud of you."

Mr. Reid then called upon Edgar C. Weichel, the company's vice president, who responded by joining with Mr. Reid in congratulating the Birdseye employes for their splendid victory in the safety contest, in competition with other underground mines in the anthracite district. "The company can provide rules, regulations, and devices for safe operations," commented Mr. Weichel, "but a good safety record is impossible without the intelligent cooperation of good men. We are fortunate in having that combination at Birdseye."

At the conclusion of his remarks, Mr. Weichel introduced Joseph I. Horty, managing editor of THE EXPLOSIVES ENGINEER, to make the awards of the Sentinels of Safety trophy and flag to the winning miners.

Safety Records Show Progressive Improvement

In his talk, Mr. Horty said that "the Bureau of Mines men in Washington, who keep the scores in this annual competition, tell me that conspicuous improvement in accident prevention has been apparent at Birdseye mine, particularly since 1947. In that year, you recorded a total of 35 disabling injuries. During the past three years, that number has been reduced by one-half each year. Such progressive improvement is convincing proof that your safety programs are carefully planned and well executed, and that everyone from top to bottom has cooperated to make them work."

The speaker then directed the attention of the miners to the Sentinels of Safety trophy, prominently displayed before them. He explained the significance of the bronze statuette, representing a child in its mother's arms reaching out to welcome its father's safe return home after his work in a mine. "Keep the memory of that picture before you, on the job and off the job," said Mr. Horty. "Remember that your loved ones are waiting at home for your safe return from your work. If you will do that, it will help to stop you when you feel like taking a chance on a short cut that violates the company's safety rules, in order to get something done in a hurry in this fast-moving world of today."

In accepting the awards of the trophy and flag, Colliery Superintendent Wesley I. Stonebraker, representing the winning miners, remarked

(Continued on page 124)

HENRY H. NULL: After accepting Certificates of Achievement in Safety from Joseph V. Mather, representing the U. S. Bureau of Mines, Mr. Null, assistant colliery superintendent, presented them individually to the employes of Birdseye mine.

THE QUARRY FACE: From the top of the quarry working face, the young students observe the limestone formation at the Slate Range property and the drilling of well-drill holes in the ledge preparatory to firing a primary blast of dynamite.

QUARRY SUPERINTENDENT COOPERATES WITH SCHOOL TO PROMOTE SAFETY AMONG CHILDREN

Students hear talks and see demonstrations on the safe handling and use of industrial explosives

PAT AND GEORGE STURTEVANT*

CHARLES E. OUSLEY, a powder man for more than 30 years, is superintendent of The West End Chemical Company's quarry in Slate Range, San Bernardino County, California, 18 miles north of the town of Westend, near Trona. The quarry supplies limestone to the company's chemical plant at Westend, where it is burned with coke in kilns for conversion into carbon dioxide gas. The gas is used in a carbonation method that separates soda ash and borax from lake brine. Lime is a by-product.

"LET ME TRY IT": The boys get the feel of jackhammer drills while veteran drill runners explain how they work and what they do to reduce the size of big limestone boulders by blockhole blasting with small charges of Hercules dynamite.

Superintendent Ousley has been on the job at Slate Range for 10 years, directing the details of drilling, blasting, and recovering the limestone. He is as proud of his record of no lost-time accidents as he is of the efficient operation of the quarry. Incidentally, this perfect safety record extends back over the 10 years preceding his employment at the quarry, while he was handling and using industrial explosives at other mineral operations in California and Nevada.

His enthusiastic interest in safety prompted Mr. Ousley to inaugurate an unusual custom at the quarry for the purpose of helping to prevent accidents among children. Every year he plays host to the science classes of nearby Trona Unified School. This year, the pupils spent the afternoon of March 16 on a tour of the quarry, guided by the superintendent personally. He explained to the boys and girls the geographical formation of the area, the work in progress in the quarry, and detonated a cartridge of Gelamite† dynamite to demonstrate the power of explosives. This latter demonstration was accompanied by a talk on the subject of the safe handling and use of dynamite and blasting caps, followed up a question-and-answer period.

At these annual gatherings safety is emphasized, and the danger involved in playing or tinkering with explosives, especially blasting caps, is vividly impressed upon the memories of the young students.

Superintendent Ousley, his associates in West End Chemical Company, and the authorities at Trona Unified School are to be commended for their valuable contribution each year to the Institute of Makers of Explosives' campaign to reduce accidents caused by blasting caps among children.

It is only by intelligent planning to forestall accidents that American youth will be made to realize the potential dangers of blasting caps and explosives. In this respect, the West End Chemical Company's practice ranks at the top in a practical approach to this serious problem.

INSPECTING A TRUCK: During the tour of the property, guided by Superintendent Ousley personally, the boys and girls receive firsthand information about a 10-ton Euclid standing near the entrance, away from the quarry activities.

*Post Office Box 536, Trona, California.

†Reg. U. S. Pat. Off.

AERIAL VIEW: Looking down from an airplane on the spillway section and the north end area of the dam and reservoir under construction on the Republican River in south-central Harlan County, Nebraska, approximately nine miles east of Alma.

THE Harlan County Dam IN NEBRASKA

Huge flood-control structure on the Republican River will be two miles long, with a 1,350-ft. spillway in the center

W. T. LOGSDON*

THE U. S. Army Corps of Engineers, Kansas City District, awarded a contract on February 6, 1948, to Harlan Construction Company, which comprises a group of seven nationally prominent contractors, for the construction of Harlan County Dam on the Republican River, 2 miles east of Republican City, Nebraska, on its bid of $19,432,386. The seven contractors in this joint venture are Guy F. Atkinson Company, South San Francisco, California (sponsor); Bressi & Bevanda Constructors Inc., Los Angeles; David G. Gordon, Denver, Colorado; Charles L. Harney, Inc., San Francisco; W. E. Kier Construction Co., Los Angeles; A. Teichert & Son, Inc., Sacramento; and Trepte Construction Company, San Diego.

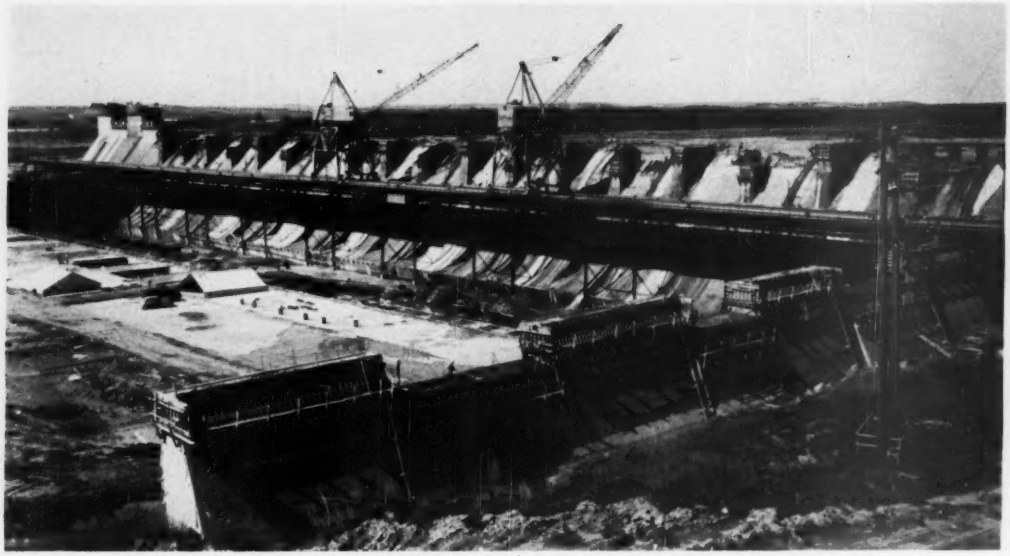
The Harlan County Dam is being built as a flood-control project, with irrigation a supplementary feature. Provision has been made for the future installation of power facilities. Upon completion, the dam will be approximately 2 miles long, with a 1,350-ft. gravity-type spillway in the center. It is one of a half-dozen large dams now being built under the Pick-Sloan Plan for the Missouri River basin. With approximately a million-acre-foot capacity and a shore line of 55 miles, it is the largest of all similar structures located on the tributaries to the Missouri River. It is located on the river where disastrous floods have occurred, notably in 1935 and 1947.

Some of the principal items in the contract specifications call for approximately 13,500,000 cu. yds. of excavation, including drilling and blasting 325,000 cu. yds. of foundation chalk material; 250,000 cu. yds. of spalls and riprap rock; drilling 100,000 lin. ft. of 6-in. anchor holes; 5,700,000 lbs. of reinforcing steel; 450,000 cu. yds. of concrete; and 3,000,000 lbs. of tainter gate, spillway bridge and other structural steel. The completion time limit is 1,400 calendar days. Work could have been completed in 1951 had it not been necessary for the Army engineers to make extensive changes in the foundation in the concrete area. At present, it is estimated that the Harlan Construction Company will complete its work early in 1952.

Subcontractors

A minimum of the work is being sublet: McKinney Drilling Company, Nacogdaches, Texas, has a subcontract to drill approximately 70,000 lin. ft. of anchor holes; M. J. Junkins, Montrose, Iowa, is spot-sodding and mulching the downstream slope of the dam; the fabrication and installation

*Hercules Powder Company, Des Moines, Iowa.



SPILLWAY, SOUTH SIDE: A view of the spillway under construction. Specifications call for 13,500,000 cu. yds. of excavation, 5,700,000 lbs. of reinforcing steel, and 450,000 cu. yds. of concrete.

of eighteen 30 by 40-ft. tainter gates is under subcontract to Consolidated Steel Company, Orange, Texas; and the tainter gate operating machinery is being fabricated by Williamette Iron and Steel Company, Portland, Oregon.

Foundation material for the dam is Niobrara chalk, a "young limestone." The rock in the company-owned quarry, located about 15 miles east of the dam site, is an irregular formation of Ogalalla quartzite, difficult to drill and blast. It is hard on drill steel and any equipment with which it comes in contact; being brittle, it is easy to overshoot in primary blasts.

Holes for blasting are drilled with Gardner-Denver and Sullivan wagon drills and jackhammers. In the chalk formation, Gardner-Denver auger steel and bits are attached to the drills; in the quarry rock, Brunner & Lay round and hex steel with Timken SH detachable bits is employed. Air for the drills is supplied by two Gardner-Denver portable Diesels, 500 c.f.m.; two Gardner-Denver portable gas units, 105 c.f.m.; and one Sullivan portable Diesel, 365-c.f.m. capacity.

EXCAVATING FOR SPILLWAY: The equipment used in excavating and hauling blasted chalk formation in the spillway section included an 80-D Northwest power shovel and backhoe, and end-dump Euclid trucks of 11-cu. yd. capacity.

DRILLING IN CHALK: Wagon drills with auger steel attachments are used to drill vertical holes for blasting in the chalk.

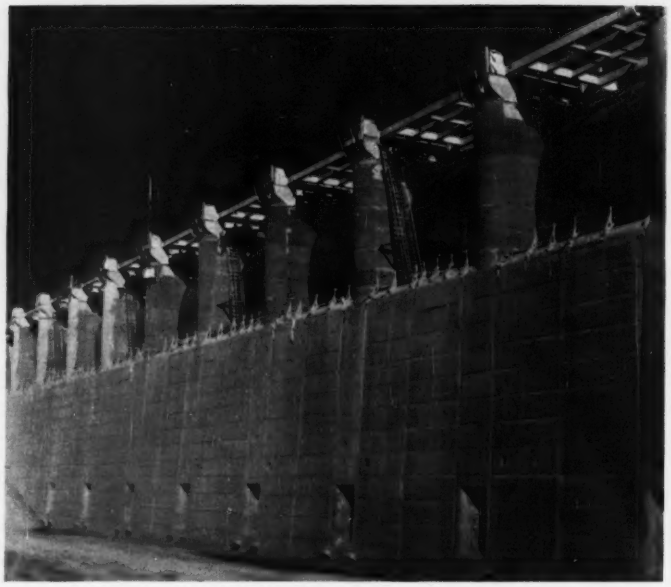
Blasting

For blasting the chalk formation in the dam foundation and the spillway, the drill holes are 3 in. in diameter, 10 ft. deep, spaced on 5 and 6-ft. centers. The chalk was excavated to a depth of 40 to 50 ft., in 10-ft. lifts. Primary blasts consisted of 8 to 15 holes, each loaded with Gelamite* 3, in 2 by 8-in. cartridges, primed with No Vent* Delay Electric Blasting Caps, from zero through the fifth period of delay. All charges were stemmed with chalk drill cuttings. The cap leg wires were connected in series and blasts were fired with a conventional blasting machine.

In the quarry quartzite formation, wagon drills were used to drill 2-in.-diameter holes, 10 to 15 ft. deep (based on the thickness of the rock), with spacings on 9 by 7-ft. centers. Each hole was loaded with Hercomites* 2 and 4, in 1½ by 8-in. cartridges, primed with Short-Period Delay Electric Blasting Caps, from first through fourth period of delay. Primary blasts varied from 50 to 100 holes. All holes were stemmed with drill cuttings and sand. The cap leg wires were connected in series parallel, 2 to 3 series, with not more than 30 to 40 caps in a series.

The results from blasting in the chalk and quartzite were uniformly satisfactory. A good percentage of the chalk excavated at the dam site was used as berm fill material in the dam. The blasted rock excavated in the quarry was used as riprap. The fines were either wasted or run through the crushing plant and made into blanket material for use on the project.

*Reg. U. S. Pat. Off.



SPILLWAY, WEST SIDE: A close-up of the 1,350-ft.-long, gravity-type spillway on the west side. The steel gates near the top of the structure will be used to release impounded flood-water, in excess of the normal amount stored.

THE SIDEWINDER: A close-up of the sidewinder rig in a combination cutting and mixing operation as it is directed by the operator into the spillway section that previously had been blasted and excavated.

The excavating and hauling equipment employed in the chalk formation included an 80-D shovel and backhoe, and end-dump Euclid trucks of 11-cu. yd. capacity. A Joy shale saw was used for cutting vertical faces. At the quarry, an 80-D shovel, a fleet of K-11 International truck-tractors with Fruehauf semitrailers, end-dump Euclid trucks (11-cu. yd. capacity), and TD-24 International and D8 Caterpillar tractors with rock rakes for quarry processing were used.

The reservoir that will result from the construction of Harlan County Dam will provide 500,000 acre-feet of space for the storage of water during high-river stages, to prevent flooding of the valley downstream from the dam site. Water will be provided for the irrigation of 90,000 acres of land, which has insufficient rainfall to assure crop production. The supplying of this water at the proper time for irrigation purposes will increase crop production and stabilize agriculture.

A storage capacity of 200,000 acre-feet will be available in the reservoir for incidental use, which will allow for the accumulation of silt for over 100

SAWING CHALK: A mine saw, left above, was employed successfully to cut neat line incisions in the Niobrara "young limestone" chalk formation in the stilling basin and the training wall areas, as shown in the illustration on the right.

years without encroachment on the storage provided for flood control and irrigation purposes.

The recreational possibilities provided by the lake will be many and varied. All sports and activities usually associated with a large body of water will be possible. Sites for private cabins, clubhouses, and group camps will be available for lease to individuals and civic organizations; also, concessions for the convenience and enjoyment of the visiting public will be leased and operated by businessmen. The area will be open to all.

As indicated previously, the Harlan County Dam is being built under contract for the U. S. Army Corps of Engineers, with Lt. Col. L. J. Lincoln, district engineer, directing operations. Lt. Col. J. K. Addison is area engineer, and B. V. Reany is project engineer. For Harlan Construction Company, R. W. Atkinson is project manager; J. A. Kier is associate project manager; G. C. McBride, quarry superintendent; E. M. Daley, excavation superintendent; J. C. Moore, concrete superintendent; Brad Jarmin, office manager.

OGALALLA QUARTZITE: The rock in the contractor's quarry, an irregular Ogalalla quartzite formation, is difficult to drill and blast. After quarrying, it is processed to supply riprap and spalls. The fines were used as blanket material.

QUARRY AND PLANT: In the quarry a Northwest 80-D shovel loads out blasted quartzite into autotrucks for delivery to the processing plant in the rear, where it is crushed and screened to supply the rock requirements on the project.

Sage Advice to Mine Foremen

A veteran mining engineer comments on some experiences during the past 35 years

J. J. RUTLEDGE*

AN OLD-TIME vaudeville actor had to make a favorable impression on an audience within the first few moments of his appearance on a theater platform. If he failed to click with the people out front soon after coming on stage, he was hopelessly lost as far as his future success as a public entertainer was concerned. The majority of public speakers concentrate on getting the attention and interest of listeners with their opening remarks. In like manner, a mine foreman should, from the start of his supervisory activities, take into consideration the variable

natures of the men working with him. He should take advantage of opportunities to create a feeling of mutual interest among the miners, thereby gaining their respect and cooperation. And, he should examine himself and his methods periodically, not only from a production standpoint, but also from the employe relations angle.

A mine foreman should be like a captain on an old-time ocean-going ship, in complete command of the operations for which he is responsible and of the activities of the men under his supervision. Such authority is designated to mine foremen in Illinois, under the law.

Years ago, most of the coal mine properties had superintendents. In many cases, these men were the owners of the mines, or were substantial stockholders in the companies that controlled the properties. Some of them devoted their efforts to keeping the books or to other work of a clerical nature, or as maintenance supervisors of surface equipment and materials. Only rarely did they go below ground to make tours through the underground workings. When they did go below, the foreman of the mines were insulted. These old-time mine veterans were the undisputed bosses of everything that went on underground. They were like choir leaders in some of the churches of long ago—they were deeply offended if any member of the congregation joined in the singing.

In recent years, mining engineers with excellent technical training and practical experience underground have been placed in charge of operations in many coal mines, particularly in middle western states. These men have proved to be splendid superintendents and mine managers. In such cases, there is no division of supervisory responsibility such as existed in former years.

Unfortunately, some American coal operators have been prone to overman the management personnel. Since foremen have become certified, a situation that is highly criticized by the miners often develops. In general, certification is not required of the management staff above ground. One certified man may be supervising operations underground while four or five superintendents or assistant superintendents, bookkeepers, and clerks work in the office on the surface. In such circumstances, the usual complaints can be summed up in the remarks of one old, experienced coal miner: "Johnny Evans, the mine manager, is carrying four or five people on his back." When questioned as to what he meant, the old miner answered: "Why, they couldn't operate that mine without Evans, or some other certified foreman. Those four or five people in the office above ground are paid good salaries and that expense is added to the underground costs which Evans has to keep down as low as possible. That's what I mean."

In all probability, a disaster which occurred in a mine in Great Britain recently would not have happened if the man in charge of the underground workings had been kept fully informed regarding the geological conditions of the area in and around the mine. The mine organization included four supervising officials, evidently technically trained men. They lived at some distance from the mine. These officials directed the work of surveying and construction done in the mine and surrounding territory without consulting and cooperating closely with the mine manager, as they should have done.

*621 St. John's Road, Baltimore, Maryland.

William Lloyd

A young Welshman named William Lloyd, in charge of a large, mechanized coal mine, was a handsome man in the prime of life, with an ingratiating personality. The several hundred men working under him on the surface and underground spoke German, almost to a man. When Lloyd took the position, he had to learn enough of the German language to be able to converse with the men about their respective duties. Although not of the same nationality, he was well liked by the workmen. There was a widespread business depression at the time, particularly in the mining business. Conscientious William Lloyd was one of the first foremen to introduce sound business methods underground.

The coal company's superintendent, on monthly visits to the mine, kept urging Lloyd to load cleaner coal. The company's general manager, in the main office several hundred miles from the mine, kept demanding of the division superintendent to see to it that cleaner coal was produced in his district. Unable to satisfy his employers, Lloyd chafed under the repeated urgings of the division superintendent. This latter man had come up the hard way, advancing from a job of mining coal at working faces to his present position in the operating management. He had had many years of training, possessed remarkable patience, and was amazingly shrewd. He realized that Lloyd was worried by the repeated demands for cleaner coal. However, he was on the spot because of the constant urgings of his boss, the general manager, for cleaner coal from the mines under his charge. One morning in mid-winter, the division superintendent came into the mine workings and went to Lloyd's office. After bidding the foreman a cheerful good morning, he remarked: "Billy, I just want to know whether you are running this mine or whether the men are running it. It seems to me that you have lost your grip on the men, especially in recent weeks. The company officials tell me they can buy coal cheaper than we are producing it here. They say they don't need the coal anyway. Unless the men load it clean, we will have to shut down the mine." As previously indicated, a depression was on at the time and many people had difficulty finding work. The weather was cold and men were willing and anxious to accept jobs of almost any kind. After his remarks to Lloyd, the division superintendent went through the mine workings with the foreman, as was his custom. At the end of the shift, he left the mine with a cheery goodbye to the foreman.

As the division superintendent anticipated, Lloyd appeared at his mine office early next morning, refreshed by a good night's sleep and a hearty breakfast. He began to work earnestly on the loaders, impressing upon each man the necessity of loading clean coal. Several of the older men resented this constant urging and quit work. But, nothing daunted, Lloyd persisted in his campaign and, eventually, when business improved he was awarded a prize by his company for producing the cheapest coal among the mines in the division The division superintendent's philosophy was based on these facts: Since he had been moved up from the ranks to a responsible position, he knew that he would have to have the good will and the wholehearted cooperation of all the employes of the mine if he were to merit advancement to the post of general superintendent. As one old mine employe put it: "The Big Boss has his grip on all of us and he never loses it." Like the comedian performing on television, a foreman must get and maintain a grip on his audience—the workers under him. He must be worthy of the loyalty and the cooperation of the miners if he is to succeed in the job of foreman in a coal mine.

Watkins

An engineer, whom we will refer to as Watkins, came to the United States from Europe and got a job with a railroad construction company. He had had excellent training in several industrial jobs that required a knowledge of engineering, with the exception of the coal mining business. His contacts with workmen had been extremely limited; also, he lacked the ability to handle workmen, particularly American workmen. This was glaringly apparent in his relations with coal miners. From the beginning of these contacts, the miners' dislike of him was unmistakable, especially in the case of the older miners.

At this particular time, some new mines were being opened and Watkins was placed in charge of operations. At every opportunity, the miners delighted in causing trouble for him in his new job. As work progressed, Watkins made frequent trips to the shafts and the surface plant at night, when he was not expected. During one of these midnight visits, he stopped at the mouth of one of the shafts. It was down about 100 ft. and was being sunk to a greater depth. Standing at the top of the shaft, he could hear the workmen discussing him. What he heard astounded him. Not only was he embarrassed, but he was truly humiliated. After that experience, he made determined efforts to be more considerate and tolerant in his dealings with the men. Considerable improvement was evident from then on. But, Watkins could not conceal from the men the fact that he felt that all of them, particularly the coal miners, were just about on a level with animals. Had he been like the aforementioned vaudeville actors, he would have sensed the reaction of the men soon after his first talks in issuing work orders. If he could have felt or noticed the resentment of the men, in all probability he would have changed his approach and his speech. The efficiency of the mine dropped off considerably under his supervision and, eventually, he was succeeded by a man thoroughly experienced in mine work and in the handling of men working under him.

TALES OF A GOLD MINER IN NICARAGUA

By C. CARLETON SEMPLE*

Some rambling recollections of mining operations under peacetime and wartime adversities

PART V

For some reason, the importation of fertilizers into these countries is beset with difficulties. Hundred-pound lots of phosphate and nitrate, of both potassium and ammonium bases, were brought in and combined in various proportions to get the mixtures that would best meet the requirements of the different plants, according to whether the wood, the leaf, or the fruit was to be used. Small paper packages of the mixtures were placed to reach the roots. To be effective in a rainy country, such soluble fertilizers had to be supplied frequently in small quantities. If not, more would be lost in drainage waters than the plants absorbed. The results were immediate and the cost probably was not much greater than would have been the case with standard prepared fertilizers. As all these salts contained only food elements for plants, no "burning" ever resulted, even on seedlings. All the plant hormone-vitamin products were used regularly as well as the legume inoculant. Without them it would have been almost impossible to raise papayas, as the seedlings are so prone to "damping off." In fact, until such aids were used we lost all; after they were introduced, we lost none.

Giant grackle were everywhere. They not only awakened everyone at earliest dawn as they chased each other along the tin roofs, but they delighted in pulling up all the sprouted corn. They cut the sprouts into 1-in. pieces, making little piles. They would not eat from the piles until every last plant was destroyed. They nested in coyol palms where they quarreled all night. It was not until the gardener had pulled out every nest and we began shooting them on sight that they all left suddenly and never returned to annoy us.

*Director, Empresa Zopel, Apartado 552, San Jose, Costa Rica.

Camp Schools and Hospitals

According to contracts with the Government, all mining companies had to establish schools in their mining camps, including teachers, textbooks, and necessary accessories. In addition, dental and medical care and an emergency hospital had to be provided. That is the case throughout Latin America. Sometimes this becomes quite a problem. The remoteness of some mining camps and the limitations of such a job make it unattractive to most medical men. We were fortunate at Matagalpa in being only 10 miles from a good-size town, where there were plenty of physicians with varied practices and a good hospital already established. Our mine could afford to make substantial contributions to this hospital, with no greater outlay than would have been necessary to meet the letter of the contract with a hospital exclusively our own. Such a situation makes it possible to arouse favorable public sentiment. Whenever some special piece of equipment was needed, the mine would match the town's subscription and everyone in the region was benefited.

JUST BEFORE DAWN: Giant grackle chased each other along the tin roofs of homes in the camp, awakening everyone at earliest dawn. They delighted in pulling up sprouted corn and cutting it into 1-in. pieces, making neat little piles.

The hospital at our mine could, therefore, be reduced to a dressing station, with a few beds ready when needed. Only one fatal accident occurred—a driller somehow pierced himself with a drill. After a first dressing, all other cases could be taken the 10 miles to Matagalpa, usually in the company car or truck. In a few serious cases, they were transported on a stretcher carried by men.

An attendant, or "practicante," was resident at the mine, a young man who had held a position corresponding to interne for several years. He had had considerably more training that could be classified as first aid. He also attended to sanitary surveillance and was assistant timekeeper, receiving the pay of all three jobs. The attending physician timed his visits according to seasonal demands or telephone calls.

A SERIOUS ACCIDENT CASE: Occasionally, a workman met with a serious accident. In such cases, after first-aid treatment had been given, the injured employe was carried on a stretcher by fellow workmen 10 miles to the hospital in Matagalpa.

In 10 years I have not been able to mail a letter after five o'clock in the afternoon, at which hour the post office closes and letter drops, to say nothing of letter boxes, are unknown in the doors of the post office. I had a letter drop cut in the door of the company house in Matagalpa so that newspapers could be delivered, but children persisted in pouring filth from the streets through the slot. In San Jose, Costa Rica, the experience was repeated, although the post office there has never closed its doors night or day and letter boxes are found near street corners.

Water Supply

The water supply at the mine entered pipes far above where it was customary for people to pass, let alone live, and thence was stored for distribution in a number of tanks. As it entered the first and highest, it passed through a special pipe with screens and then into a trap by means of which several pounds of granulated silver were retained; also, a pair of silver electrodes, supplied at first by a few dry batteries and later from a line from the lighting circuit. The electrodes were made from the usual assay silver foil, but the granulated silver was made in the lab by tumbling scrap copper wire in a 5-gallon bottle on the rolls made for milling agitation tests. The nitrate of silver came from the parting solution which was saved in the regular course of assaying. The deposited silver was screened at 20 mesh and the oversizes used for water sterilization. It was in porous, spongy grains and seemed better than silver-coated sand or beads. Monthly samples were taken to laboratories in Managua for determination of living organisms. The drinking water in the staff houses was further treated with a few drops of permanganate and a few ounces of silver-treated water, and left in carboys overnight before filling into the Berkefeld filters, the filter block of which was covered by a layer of Hyflo to facilitate cleaning. All milk used was pasteurized. We were too far from laboratories to experiment with the sterilization of milk by the Catadyn process.

Because of the unsanitary habits of a people, a large percentage of whom go barefoot as children, the prevalency of various types of dysentery and worm infestations is not to be wondered at. I suspect that far more people suffer from the effects than are aware of their condition. Infection or infestation can come about from so many ways, even to the air breathed, that a list would include most every human activity. But the surest of all is direct contact of bare feet with the ground. Many types of germs gain admittance to the blood stream in that way and thence are carried to the lungs without causing any pronounced symptoms. Eventually, they migrate to the mouth and on to the intestines, where some grow to incredible sizes. Fortunately, most of the common varieties are destroyed by antihelminthic drugs, such as santonin and hexylresorcinol. Santonin is used in small doses of one to three grains in tablet form, containing a half grain each of the drug and calomel. The tablets are sometimes coated with a sugar cap that induces children to eat them like candy. But it is a poison and a tricky drug, and several days of treatment may be necessary. The hexylresorcinal is nonpoisonous and unquestionably the best, safest, and easiest. It is sold in hard, round pills the size of a pea. One such preparation is known as Crystoids. Only a single treatment seems to be required in most cases.

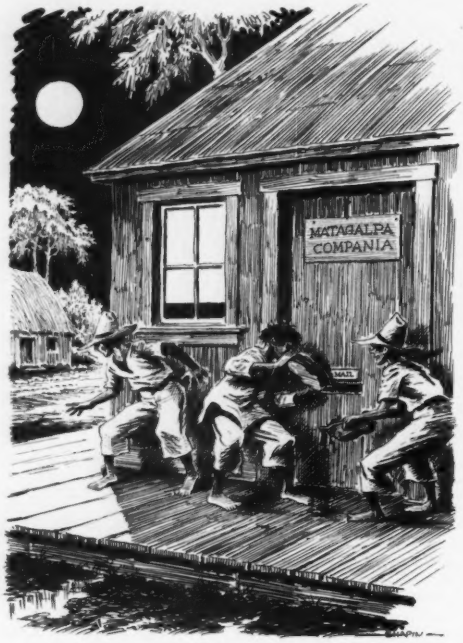
If these big pills are masked in honey, or some similar sweet, even tiny tots can be made to swallow them. They are intentionally made to be unchewable and to be swallowed whole.

Amoebic Dysentery

Treatment with sulfaguanadine or sulfasuccidine, with plenty of Brewer's yeast and liver extract, seems to be the current effective medication for the bacillary type of dysentery. But it is the amoebic type that seems to have afflicted almost everyone, sooner or later. Our cases were cleared up with a 10-day treatment with carbarsone, totaling 25 grains, taking two 1¼-grain capsules daily. When exceptional cases required a second treatment, a rest period of 10 days was prescribed before continuing with a second course. Emetine used as an injection was once a favored drug for treatment of this type. However, in addition to being a somewhat unpredictable poison, it is almost always barbarously painful. Some of the physicians use bismuth salts in conjunction with other treatments. One drug manufacturer used to put out tablets called Eldoform, consisting of tannic acid and Brewer's yeast, intended to change only the consistency of the stool. For a long time I thought of trying a bismuth subgallate called dermatol, a powder much used as a dusting powder for wounds and skin diseases. After a search of many months I found a rather vague reference about a dose of only a fraction of a gram. That did not conform with my ideas. Finally I decided to risk a heaping teaspoonful suspended in sweetened milk, for the stuff tastes like a highly perfumed talcum powder. A single dose has ended, within a few hour, all the intestinal disorders that I have undergone during the past three years, with succession intervals too far separated to suspect relapses.

Prior to the outbreak of World War II, it was the habit of many people about Matagalpa to add a little Chinosol to their drinking water. This was the name of tablets of oxyquinoline sulfate manufactured by a German firm in 1-gram and 1/25th-gram sizes, the first for dissolution in two liters of water, while the little ones were just enough for a glassful. It was a very powerful antiseptic that could be used for all such purposes, and was not poisonous. When these tablets were no longer procurable, we tried bulk powder. That was inconvenient, because it had to be weighed each time solutions were made up. But, we preferred oxyquinoline benzoate to the sulfate. Chloramine-T or Chlorazene tablets may also be used for the treatment of drinking water. They afford a convenient means for one to carry about, and is the equivalent of the chlorine treatment used almost universally nowadays.

A great aid to treatments for dysentery is a diet of apples, bananas, and yogurt. The apples should be peeled and grated; the bananas are thought by some to be more effective if mashed to a pulp. If either, or both, is mixed with sweetened yogurt, one has not only a tasty dessert, but also what may be a cure for the dysentery without undergoing medication.



THROUGH THE SLOT: A letter drop was put in the door of the company office in Matagalpa for the delivery of newspapers. Children persisted in pouring filth from the streets through the slot. In San Jose, the experience was repeated.

Malaria

There was a time when malaria was far more prevalent than now seems to be the case, and the attacks were more severe especially in the regions of lower elevation and along the Caribbean Coast. It still is something that one must ever be on guard against. Some of the worst malarial regions are found in Peru, on the eastern sides of the Andes along the great tributaries to the Amazon. Villages and once-great cities are found abandoned and overgrown, all on account of malaria. The Pacific Coast is much better, except in the valleys of numerous small rivers that arise from melting snows and rains that have been borne by easterly winds from the Atlantic. Through some accident in topography, these rivers drain westward. Water is abundant during a short season early in the year. For the rest of the year, it hardly makes an appearance at all, sometimes only a few inches deep in a narrow course in the river beds. In flood season, such rivers may be difficult to cross, yet viewed from a plane few appear to reach the ocean. They disappear in the coastal desert sands to flow into the Pacific entirely underground, if at all. The soil in the valleys is rich and produces most of the cotton grown in the country. An extension of the areas is the object of most irrigation projects. The most severe types of malaria are prevalent in these valleys, especially during the low-water seasons, and these types are most resistant to treatment.

Quina Extract

It is not strange that from Peru should have come the first specific medicine found, namely, the extract from the bark of the calisaya tree or

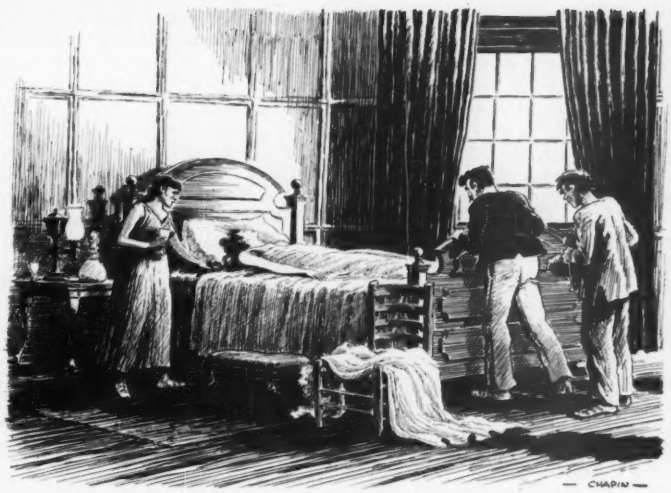
quina. The name is derived from a hill slope in Bolivia where the first specimens of quina amarilla, or yellow, were found, considered the most valuable of the three varieties. Some accounts ascribe the name to an Indian who first called attention to the concoction as an antipaludiant. The Countess of Chinchon, wife of an 18th-century viceroy of Peru, was cured of a malarial attack by treatment with calisaya extract. Going home, she introduced it to Europe and, as a consequence, was honored by having the species named for her, Cinchona. By some perversion of the English, it has lost an h in translation.

Most accounts fail to mention the fact that the extract of quina bark was used in conjunction with the extract of another Peruvian plant, erythroxylon coca—the divine plant of the Incas. Only three people seem to have appreciated this plant outside of the Incas. One was William Mortimer, a New York physician, who wrote a fascinating book on the subject; another, an Italian-Frenchman, soaked the coca leaves in Bordeaux wine to produce Vin Mariani; the third was the originator of a popular cola formula. A bottle of Mariani wine always stood on the night table in my grandmother's room when I was a youngster.

When coca leaves are chewed or taken as tea that has been brewed from its dried leaves, the human body makes violent efforts to eliminate it from the system through the lungs, principally by perspiration. In doing so, the lactic acid or whatever it is that accumulates in the system to produce fatigue, is carried away. The equivalent of the bodily recovery from a night's sleep is produced in 15 to 30 minutes. The quinine of the one extract destroys the malarial organism as it emerges from a bursting blood corpuscle, the coca eliminates the haematin or poison produced by the organism from the haemoglobin of the blood, through lungs, perspiration, and kidneys. The organism destroys the blood cell, the product of the organism's metabolism that causes the symptoms called malaria.

Plasmoquin and Atabrine

Long before they ever became widely known in the United States, an internationally known drug manufacturer introduced two synthetic products into Peru for the treatment of malaria, plasmoquin and atabrine. Plasmoquin was used alone or in combination with quinine. It was also supplied in tablet form, both as the simple medicament and in combination with quinine for oral administration. The atabrine, with five thousandths of a gram of plasmoquin, was sold under the trademark name of Atepé. The prescribed treatment was to take one tablet after each meal for 5 to 7 days, or for 5 days then rest 2 days. After the rest, the treatment was resumed by taking the tablets for 2 more days, thus spreading the course of the treatment to a total of 9 days. Usually, all forms of malaria yielded to this treatment, including the type prevalent in the valleys.



QUINA CURED A COUNTESS: In the 18th century the Countess of Chinchon was cured of a malaria attack by treatment with quina extract. Later, she introduced it to Europe and, as a consequence, was honored by having the species named Cinchona for her.

(To be continued)

VIBRATION TROUBLES?

EXPLOSIVES USERS—If you are experiencing or anticipate legal or public relations problems arising from blasting effects—

Send For Our* NEW BROCHURE *Describing Our Services

"VIBRATION PROBLEMS CONNECTED WITH BLASTING: THEIR SOLUTION AND CONTROL BY SCIENTIFIC METHODS"

(Price Schedule Accompanies Brochure)

VIBRATION ENGINEERING COMPANY

131 N. WYOMING ST. PHONE 5774 HAZLETON, PA.

CONYNGHAM, PA., PHONE 4471

SAFETY AWARD

(Continued from page 112)

that the men of Birdseye mine won top honors in safety despite difficult conditions in the mine, imposed by nature. "You deserve all the nice things said about you tonight," said Mr. Stonebraker. "As other speakers have said, all of us are proud of you. And we hope you come out on top again in this year's contest."

Miners Receive Individual Certificates

Mr. Reid introduced Joseph V. Mather, assistant chief of the Wilkes-Barre branch, U. S. Bureau of Mines, as the next speaker. After congratulating the winners, Mr. Mather discussed some of the aspects of the 1950 National Safety Competition, with special comments on the records of the anthracite underground mines. He pointed out that the injury-severity rate for the 52 mines enrolled in 1950 was 9.20 days lost per 1,000 man-hours during a total worktime of 20½ million man-hours. The Birdseye injury-severity record last year was 0.167 day lost per 1,000 man-hours of operation. "My associates in the Bureau of Mines join with me in paying tribute to you for your consistent progress in preventing lost-time accidents in your mine."

Mr. Mather presented Certificates of Achievement in Safety to Assistant Colliery Superintendent Henry H. Null, who distributed them individually to the Birdseye miners. In moving around the room to present the certificates to each miner, Mr. Null commented that "some of these men have worked at Birdseye since 1910. Such a veteran organization is one of the important reasons why Birdseye mine was awarded the Sentinels of Safety trophy and flag tonight."

Among the guests at the ceremony were Michael J. Kosick, secretary of the Anthracite Board of Conciliation; August Lippi, president of District No. 1, United Mine Workers of America; Joseph Zimmie and John Maholick, Eddy Creek committeemen of the U. M. W. of A.

The Explosives Engineer on Microfilm

The six issues of THE EXPLOSIVES ENGINEER published in 1950, which comprise Volume 28, will be available on microfilm. This step has been taken to meet the pressing problem of shelf and storage space which faces all public and special libraries today.

Inquiries concerning purchase of the microfilm edition should be addressed to University Microfilms, 313 N. First Street, Ann Arbor, Michigan.

•

Regular cloth-bound volumes will continue to be available from the publication's editorial offices, 990 King Street, Wilmington, Delaware, at the regular price of $3.50 (United States and Canada); $4.50 to post-office addresses in other countries.

McCarthy Drills PAY OFF!

SELF-PROPELLED HORIZONTAL DRILL

FOR BLAST HOLE DRILLING

● Heavy all welded steel carriage and four individually adjustable leveling jacks make setups faster, drilling smoother. Fingertip hydraulic control permits instantaneous change of drilling feed. Bores 5 to 10-inch diameter blast holes to horizontal depths of 120 ft. or more.

Heavy-Rugged

✓ McCARTHY DRILLS PAY THEIR WAY
✓ MAKE MORE MONEY FOR YOU
✓ RECORDS SHOW 40% MORE HOLES
✓ LIST OF USERS ON REQUEST

● McCarthy Vertical Drills adapt to any job where ordinary rock formations are to be blasted.

Designed with compact retractable hydraulic tower for Truck, "Cat," Half-track or Jumbo mountings. Power shafts made of tough alloy steel. Simplified construction throughout.

Over-all height with tower reclining: 7 ft., 4 in. Wt.: 5,100 lbs. All McCarthy units can be operated with Gasoline, Diesel or Electric power units. Write for descriptive literature.

Powerful

VERTICAL DRILL

FIFTY YEARS DRILLING EXPERIENCE 1901-1951

SALEM THE SALEM TOOL COMPANY SALEM

NEWS NOTES

CARBON MONOXIDE RECORDERS

Mines Safety Appliances Company, Pittsburgh, has announced that motorists using Pittsburgh's new Squirrel Hill tunnel on the Penn-Lincoln Parkway will be protected against carbon monoxide fumes by sensitive instruments, known as MSA Carbon Monoxide Recorders, that can detect one part of the deadly gas in a million parts of air. These instruments will be installed to analyze air samples from the tunnel and continuously record percentages of carbon monoxide present.

Two MSA CO Recorders are to be used for each of the two parallel tunnels. Air samples are drawn from strategic locations in the tunnels to the instruments in the ventilation building. In the analyzing equipment, the air samples are dried and then enter a chamber containing "Hopcalite," a granular chemical that causes oxidization of carbon monoxide to carbon dioxide.

The instruments are calibrated so variations in the amount of heat show accurately the percentage of carbon monoxide present in the air samples. No other common gases or vapors in the tunnels can affect operation of the instruments.

When the instruments detect concentrations of carbon monoxide approaching a predetermined limit, ventilating equipment supplies more air for the tunnels.

Besides conserving power used in ventilating equipment motors, the detecting instruments act as gauges of fresh-air requirements and provide a permanent record of carbon monoxide concentrations.

For further information, please communicate with Mine Safety Appliances Company, Pittsburgh, Pennsylvania.

HOIST FOR STEEL ERECTION

A new hoist designed specifically for steel erection has been announced by American Hoist & Derrick Company of St. Paul, Minnesota. Called the Iron Workers' Special, this new hoist incorporates features specified by steel erectors and hoist engineers from the industry.

The Iron Workers' Special through a torque converter, anti-friction bearings, and air-operated contracting-type tandem-band clutches permit an operator to "feel" his load into position accurately and smoothly. Brake linkage between foot pedals and contracting bands is anti-friction bearing mounted for easy operation.

Safety features include a back-up brake that engages automatically on reversal of the drive shaft, ratchet rings of forged steel with compression-type dogs and overload regulating air valves which permit clutch slippage in case loads become "snagged" or "hung up" while being hoisted.

Controls of the Iron Workers' Special are located on a centralized stand. The stand is rotatable and raised high enough to allow the operator to watch drums at all times.

Basically, the Iron Workers' Special is a two-drum hoist. A third drum and derrick swinger can be added if desired. Easy field installation of the extra drums or derrick swinger is possible since matching surfaces are machined and drilled at manufacture.

There are three models available: Model SE 140 with 14,000 lbs. single line pull; Model SE 180 with 18,000 lbs. single line pull; and Model SE 250 with 25,000 lbs. single line pull.

A new catalog may be obtained by writing to American Hoist & Derrick Co., St. Paul 1, Minnesota.

SCHRAMM UNISTAGE COMPRESSOR

This latest addition to the complete line of Schramm Compressors represents all of the refinements and advanced improvements made possible by over fifty-one years of manufacturing experience.

With an actual air delivery of 210 cu. ft. per min., the six-cylinder engine and six-cylinder compressor unit is designed for continuous heavy-duty twenty-four hour service.

One important feature of the 210 Unistage Compressor is the fact that 90% of the engine parts are interchangeable with the compressor. This simplied design eliminates two-staging and intercoolers, and requires fewer parts.

Pneumastat control cuts fuel costs up to 50%

Electric starting, speed control, cam-operated mechanical intake valves, dual fan belts are some more of the many features found in this modern compressor.

For complete information, communicate with Schramm, Inc., West Chester, Pa.

NEW TUNNELING MACHINE

The Demo-Canon Engineering and Manuturing Company, Los Angeles, California, has developed a new machine called Demo Automatic Gang Drill to speed up tunnel driving. The new gang drill, using Tilden Konkrete Kore-type tungsten carbide bits, will work the entire face of a tunnel in a single operation.

The present machine has a face suitable for driving a tunnel in rock 6 ft. 9 in. wide, with an arched roof having a total height of 7 ft. 6 in. As now set for work, the machine is well adapted for ordinary mining purposes. The same type of machine can be made to drive tunnels of other sizes and shapes.

The operator is located in a fully protected, enclosed cab where all the driving controls are conveniently arranged on a console. Beyond the control panel are located the power plant, gear boxes, compressor units, and other integrated components of the machine. The present model has 28 drills—15 outside drills and 13 fixed drills. Outside rows of drills are adjustable and may be moved in vertical or horizontal directions to give a pitch variation of 4½ in. in 10 ft. from direction of drive. All other drills are in fixed position, parallel to direction of drive.

For more complete information, please communicate with the manufacturer.

SHOCK ABSORBERS FOR SAFETY HATS

To provide a practical, inexpensive method of increasing protection from side blows to Hard Boiled Hat wearers' heads, E. D. Bullard Company is marketing sponge rubber "shock absorbers" that may be attached to hats already in use. The rubber pads are affixed to self-adhering strips and applied by merely pressing them firmly against the hat crown under the headband.

Advantages of this method of attaching the pads, according to the manufacturer, are that the individual head-sizing feature of the safety hat is retained, and standard headband assemblies may be used, thus simplifying replacement problems. The pads are furnished in complete sets for field installation on hats in use, or factory installed to order.

Information is available from E. D. Bullard Co., 275 Eighth Street, San Francisco 3, California.

NEW 22-TON REAR-DUMP EUCLID

The Euclid Road Machinery Company has published a 16-page catalog folder covering Models 31TD and 53TD Rear-Dump Euclids of 44,000-lb. payload capacity. Well illustrated, the catalog describes important parts such as the planetary drive axle, transmission, frame, hoists, and contains specification data on the complete units.

These new Euclid models are improved designs of the same capacity "Eucs" that are widely used for off-the-highway hauling of earth, rock, ore, and other materials in construction, mine, and quarry work. They have a struck measure capacity of 14.8 cu. yds. and are equipped with a Diesel engine of 286 or 300 hp. The 10-speed transmission provides for the speed ranges loaded of 3.1 to 32.4 m.p.h.

Copies of this Euclid folder, form No. 120, may be obtained by writing the company at Cleveland 17, Ohio, or from local distributors of Euclid equipment.

MORSE HY-VO CHAIN DRIVE

A revolutionary power transmission chain drive, developed as the result of "a job that couldn't be done," has been announced by the Morse Chain Company, 7601 Central Avenue, Detroit, Michigan. Featuring entirely new design principles and called Morse Hy-Vo (high velocity) Chain Drive, it provides a power-transmitting medium that combines the ruggedness and dependability of a gear drive with the smoothness and lack of vibration of a belt.

Opening new fields of possible applications in industry, Morse Hy-Vo makes possible single drive units capable of transmitting as much as 5,000 hp. at linear speeds up to 6,500 ft. per min. or rotative speeds up to 3,600 revolutions per minute.

The "job that couldn't be done," from which the Hy-Vo drive emerged, was an electric-powered portable, oil-drilling rig which the Emsco Derrick & Equipment Company was asked to build for Standard Oil Company of California. After months of research and experimentation, the new drive was perfected. It enabled Emsco to construct the first portable, Diesel-electric drill rig, capable of drilling holes at 20,000-ft. depths, and operating twice as fast with loads three times those ever considered.

The list of potential fields for Hy-Vo applications is almost endless, company officials say, and includes commercial fishing, lumbering, petroleum, irrigation, mining, chemicals, papermaking, quarry operations, cement and asphalt manufacturing, and steel manufacturing—in fact, any field where a heavy-duty, high-speed drive is required.

For further particulars, write to the manufacturer.

for DRILLING POWER and UNLIMITED VERSATILITY

you can't beat this New

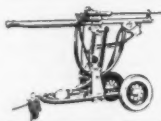
FM-3 WAGON DRILL

Most construction and mining men are familiar with the famous X-71 WD Rock Drill. Its drilling speed and hole cleaning ability on deep holes are recognized wherever Wagon Drills are used. It is the only drill made especially for Wagon Drill service.

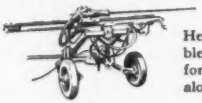
To permit even further utilization of the power and reliability of this drill, we introduce a brand new mounting known as the FM-3. It incorporates a new type of lifting mechanism and a rugged yoke that permits easy drilling in any position encountered in modern rock excavation.

Notice how the swivel wheels are turned and how the drill extends beyond wheels for line hole work against a face.

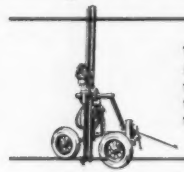
And how low the yoke can be lowered for efficient toe hole drilling.



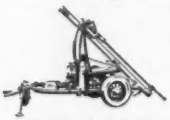
Or how, by a handy crank actuating a powerful worm gear arrangement, the yoke and drill can be easily raised to highest drilling position.



Here's an exceptionally stable and easily moved set up for drilling hole after hole along a face.



What could be more convenient for line hole work? It takes but a minute to swing the swivel mounted wheels through a 90 degree angle.



And for steeper angle drilling, here's another easy set up. All controls are at the operator's fingertips.

Remember Ingersoll-Rand Drills are sold and serviced by men who know rock drilling. Take advantage of this highly trained and skilled service. There is an Ingersoll-Rand branch office and distributor near you. Write or call today.

AS 596-5

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

AN IDEAL DRILLING TEAM—TWO FM-3 WAGON DRILLS AND THE NEW I-R 600 C. F. M. "GYRO-FLOW" PORTABLE COMPRESSOR

FOR MAXIMUM FOOTAGE FROM TUNGSTEN-CARBIDE BITS

To insure long service from tungsten-carbide bits, rock drills should combine strong rotation and fast hitting action with just the right foot-pound blow for maximum penetration.

Chicago Pneumatic's medium-weight, fast-hitting CP-34 Stoper and CP-50N Drifter are ideal for tungsten-carbide bits. Rotation, drilling speed and foot-pound blow are nicely balanced, eliminating excessive machine vibration and assuring maximum bit life.

Write for complete information.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices, 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

CUT PREPARATION COSTS UP TO 50% WITH A BUCYRUS-ERIE 42-T

BLAST hole preparation costs reduced as much as 50 percent — that's the record progressive mine and quarry engineers are making with big-hole 42-T blast hole drills. Here's why:

FEWER HOLES NEEDED

By drilling widely spaced 12-inch holes instead of many small close-set holes, less than one-half the drilling is needed to prepare a given volume of rock. Fewer holes mean much less linear footage to be drilled, fewer moves, fewer set-ups and lower drilling costs.

EQUAL OR BETTER FRAGMENTATION

Because powder can be concentrated in larger holes, the blast breaks up material as well or better than with small hole charges —with no increase in explosive per ton of material blasted. With less oversize, secondary blasting is reduced.

REDUCED DEFLECTION AND STICKING

Because of their greater weight and size, large-diameter bits are less likely to stick or be thrown out of line by cracks or fissures. Also, with a big 12-inch hole there is no waste of time and powder due to springing — no "lost" holes.

FASTER DRILLING

Bucyrus-Erie modern 42-T rigs, swinging as much as 6000 lb. of tools, drill big-diameter holes just as fast as smaller outfits drill small-diameter holes. From every angle, the 42-T's big holes save time, labor and cost.

Find out how fast-working Bucyrus-Erie blast hole drills can cut your preparation costs. Write for information on our complete line—42-T for 9 to 12-in. holes; 29-T for 6 to 9-in. holes; 27-T for 6 to 6⅛-in. holes; 22-T for 5⅜ to 6⅜-in. holes.

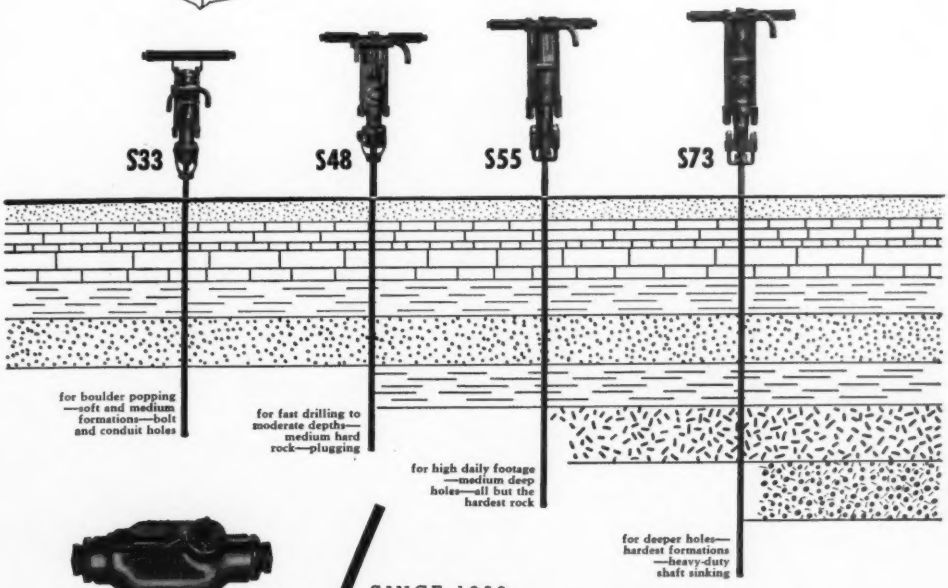
4185ic

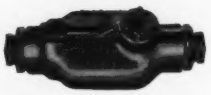
BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

any kind of rock costs less to drill with GARDNER-DENVER sinkers

No matter what kind of rock you find underfoot —there's a Gardner-Denver Sinker of the correct weight and power for lower drilling costs. Every model is designed for fast penetration—powerful rotation—clean blowing—easy holding—low air consumption. Bulletin HHD-11 gives all the facts. Send for your copy today.


S33
S48
S55
S73
for boulder popping —soft and medium formations—bolt and conduit holes
for fast drilling to moderate depths— medium hard rock—plugging
for high daily footage —medium deep holes—all but the hardest rock
for deeper holes— hardest formations —heavy-duty shaft sinking



Drills can't run dry when the LO12 Automatic Oiler guards your air lines. It stops the flow of air when it runs out of oil.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

GET MORE E.P.* PER DOLLAR

* Explosive Power determines your dynamite dollar's true value. Get more for your money with Hercules Hercomites® and Gelamites®. They give better breakage than older-type explosives . . . are more economical than extra dynamites and gelatins. Among them, there is one for practically every mining, quarrying, and construction need. Write for illustrated booklet, "Hercomites and Gelamites for Lower Blasting Costs."

HERCULES POWDER COMPANY INCORPORATED Explosives Department, 990 King St., Wilmington, Del.

XR51-1R